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Development and international cooperation in the twenty-first century: the role of information technology in the context of a knowledge-based global economy

Development and international cooperation in the twenty-first century: the role of information technology in the context of a knowledge-based global economy

Report of the Secretary-General

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Executive summary

Information and communication technologies (ICT) are central to the creation of a global knowledge-based economy and society. ICT can play an especially important part in accelerating growth, eradicating poverty and promoting sustainable development in developing and transition economy countries and in facilitating their beneficial integration into the global economy. At the same time, the experience of developed countries shows that indiscriminate investment in ICT can lead to large-scale waste. For developing and transition economy countries to benefit from the lessons of this experience and to avoid misinvestment and capture benefits, appropriate institutional arrangements need to be made. These opportunities and risks call for urgent and concerted action at the national and international levels. The United Nations system has an obligation to promote such action. To this end, there is a need for a comprehensive programme of action to be carried out through global ICT partnerships and the mobilization of the required resources. Key elements of such a programme are summarized below.

Summary of recommendations

National action

1. Galvanize the necessary political will, at the highest level, for concerted effort to tap into the digital capacity for development;

2. Devise a national ICT development strategy, establish priorities based on national development goals and encourage commitment to it at all levels;

3. Develop institutional capacity to plan ICT investments in a discriminate manner, and to build networks and communities that can take advantage of the potential of ICT for sharing knowledge;

4. Mobilize the necessary resources for ICT development and application using entry points such as education, health, governance and e-commerce;

5. Make the necessary investment in human resource development, basic infrastructure and required institutions;

6. Provide a conducive policy framework, including policies as will help to create stable and expanding markets for ICT, including, where appropriate, liberalization and privatization, to facilitate competition and a sound regulatory environment and to encourage public action to provide information to verify quality, monitor performance, and regulate transactions as well as promote universal and cost-effective access to ICT services;

7. Acquire and adapt knowledge available elsewhere and support the creation of knowledge locally;

8. Promote equal access to ICT and the inclusion of vulnerable groups, especially the disabled;

9. Address concerns about security and privacy, about cultural intrusion, about language barriers, and about the social impact of the new economy and provide the rules to protect the weak and the poor;

10. Encourage the use of information and communications technologies that can improve people's lives, such as improvements in productivity, better nutrition, better health, prevention of pollution, timely management of disasters.

International cooperation and support, role of the United Nations system

11. Provide global leadership at the highest level and mobilize and commit the necessary resources to bridge the digital divide;

12. Raise awareness, harmonize competing interests, promote agreement on principles, goals and strategies: recognize the right of universal access to ICT, and knowledge as global public good;

13. Promote access and connectivity for all, especially in developing countries, and share best practice and experience particularly in the context of South-South cooperation;

14. Promote institutional arrangements that can help countries to make discriminate investments in ICT so as to avoid misinvestment and maximize benefits;

15. Explore innovative approaches to resource mobilization and transfer and devise incentives to attract private sector investment to the provision of goods and services that currently are not feasible on a profit/loss basis;

16. Encourage cultural and linguistic diversity and local content in cyberspace, drawing on the local know-how and indigenous knowledge;

17. Develop policy guidelines and globally accepted norms and standards on regulatory issues and strengthen required institutions to address such issues as Internet governance, access, cost, privacy, security, info-ethics, cultural diversity, intellectual property and cyber crime;

18. Promote global partnerships to foster knowledge flows for development and mobilize resources;

19. Encourage reduction in the cost of access to the Internet and related ICT and further exploitation of the benefits of e-commerce, distance learning, and telemedicine;

20. Strengthen collaboration among organizations, encourage synergistic and results-oriented action as well as well-coordinated responses to new challenges.

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21. Endorse the statements of the Administrative Committee on Coordination (ACC) of 1997 and 2000 for a coordinated response by the system to the challenges posed by the ICT revolution and its call for a World Summit on the Information Society where a global action plan for access-for-all can be elaborated;

22. Address ICT issues at the highest level of the system, and mobilize and commit the necessary resources;

23. Adopt a coherent ICT strategy, strengthen collaboration among organizations of the United Nations system, encourage synergistic and results-oriented action as well as well-coordinated responses to new challenges, with appropriate institutional arrangements to avoid the risks and capture the benefits of ICT investments;

24. Integrate ICT as a key component of all development cooperation activities with appropriate institutional arrangements;

25. Update the ICT capacity of the United Nations system;

26. Call for a digital compact between the United Nations system, the private sector and non-governmental organizations as well as other stakeholders;

27. Place a new focus on developing a knowledge-sharing and -learning culture and adopt a comprehensive approach in building knowledge acquisition and dissemination capacity in the United Nations system and promote new forms of organization, including cross-functional teams, communities of practice and networks;

28. Produce an inventory of all ICT-based development activities of the system worldwide to provide developing countries with more informed choices in selecting approaches and providers;

29. Set up an "observatory", an advisory group of outstanding experts, which could absorb the mandate and activities of the Ad Hoc Open-ended Working Group on Informatics and complement the Commission on Science and Technology for Development with a view to creating a mechanism that would provide the Secretary-General, the Economic and Social Council, the Executive Boards of the Funds and Programmes and Governments with comprehensive, practical and action-oriented advice on policies and programmes and on new developments in the field of ICT for development;

30. Explore institutional mechanisms for effective follow-up action by the United Nations system to bridge the digital divide.

The principal recommendations of the high-level panel of experts convened in response to the request by the General Assembly in its resolution 54/231 of 22 December 1999 are contained in box 5.

I. Introduction[1]

1. The present report explores the potential of information and communication technologies (ICT) in advancing the process of development and optimizing the benefits of globalization. It identifies national actions needed to maximize this potential and strengthened international cooperation involving all stakeholders, including Governments, the United Nations system and other international organizations, the private sector and civil society, needed to support national efforts. The focus of the report is not on information technology per se, but rather on its potential and its impact from the broader developmental perspective.[2] The report aims to provide a policy and strategic framework for the use of information technology in enhancing development in key sectors of the economy as well as in promoting the integration of the economies of developing countries and countries in transition into the global economy.

2. It may be prudent to start with a word of caution. In promoting the potential of information and communication technology for development, there is sometimes a tendency to present ICT as an immediate panacea for all development problems and challenges. There is no magic "digital wand" that would overcome the scourge of poverty overnight. If countries were to adopt national strategies conducive to spreading the benefits of the information revolution, development would be advanced. However, even in developed countries, such as the United States of America, a certain time lag was observed between the start of the information revolution and its verifiable impact on the economy, in particular on growth. Time lags of various lengths will be present in any country that launches its national programme of ICT for development. This should, however, neither be interpreted as nor provide an excuse for inaction or a "wait-and-see" attitude. As the body of the present report will show, countries will be well advised to join the ICT revolution now: to err on the side of caution will increase the risk of marginalization even more. The digital divide can and must be bridged, but delayed action to overcome this divide will only make it wider and more difficult to close. The experience of several developing and transition countries that have launched ICT programmes (Costa Rica, Cuba, Estonia, Mali, Mauritius and small island developing States as well as others) and the inexorable logic of the emerging knowledge-based global economy and society converge to make ICT the best hope for developing countries for leveraging their potential and for integrating into the global economy. Indeed, if countries wish to integrate successfully into the emerging global knowledge economy and take full advantage of it, they cannot afford to ignore the fact that ICT provide the key to this new economy. Owing to limitations of space, the present report does not allow full coverage of the available experience accumulated by many developing countries and economies in transition. Box 1 provides illustrative examples of successful country actions.

Box 1

Examples of successful country efforts at increasing connectivity

Estonia progressed within a decade from virtually no connectivity in 1991 to now being one of the most connected countries in the world. Today all schools have been connected to the Internet, 80 per cent of bank transfers are made over the Internet, 28 per cent of the population is connected to the Internet either at home or at work, and dial-up service is the least expensive in Europe. "Smart cards" are being introduced for use for most services requiring interaction with the public administration such as hospitals, public transportation and public telephones. These results were achieved through a concerted national effort that was based on several strategic elements: the awareness that improved connectivity could contribute to the survival of a small, newly independent country; belief that ICT could help bridge the gap between poverty and wealth and encourage the rural population to remain *in situ* because it felt connected and a part of the wider world; and a depoliticization of the connectivity issue by entrusting a specially created non-governmental organization ("Tiger Leap Foundation") with determining which communities would be allotted Government monies for the purchase of hardware and software. An important element of this approach was the stipulation that recipients were required to pay 50 per cent of the cost, thereby creating a sense of ownership.

Mali's considerable advances towards connectivity are evident in user growth from 800 in 1997 to 4,500 today, although 98 per cent are in Bamako, the capital city. To compensate for infrastructure shortcomings, major emphasis has been given to encouraging the growth of public access points, such as cybercafés. Today, Mali benefits from ICT in applications such as telemedicine, distance learning and e-commerce. The impact of ICT on economic and social development has been so positive that current plans call for connecting all 701 communes throughout Mali. The success of national ICT programme was predicated, in a major part, on the full support and personal engagement of the President of the republic. Among the most important policy steps was the creation of a competitive environment for the telecommunications sector. The country has taken steps to share its positive ICT experience through "Bamako 2000" in March 2000, which brought together 2,000 participants from 48 countries.

Small island developing States have unique problems owing to geographic isolation and small internal markets that have hindered investment. In this context, ICT provide unique opportunities for these nations to participate in the global economy, enabling access to niche markets for tourism and export of local goods. Although access costs remain high at US$ 8-10/hour in island countries and users still represent less than 2 per cent of the population, there are a number of benefits that are noticeable, for example:

(a) Internet Web pages have provided up to 80 per cent of the market for some small tourism ventures and have transformed traditional access to the tourism market;

(b) Market information is now readily available to island exporters;

(c) Niche service industries have been enhanced with live financial and insurance services provided to the United States market from the Caribbean;

(d) In the Pacific, monitoring of fishing zones is done using Web technology;

(e) Telemedicine and distance education projects have been successful on a small scale, but with more investment in infrastructure, they promise to transform the underfunded education systems and understaffed health facilities.

3. ICT are usually understood[3] as pertaining to computers, networking and electronic data processing, as well as rapidly improving communications technologies, including mobile telephony, satellite communications, multifold expansion in bandwidths for voice and data-carrying capacity by the use of new materials, such as fiber-optics, as well as the software for new, more efficient and more widespread applications of these new technologies and capacities. This phenomenon is driven by new waves of technical advances that make it possible to combine these technologies in new ways, thus creating new platforms for bringing these technologies together and creating the basis for further and even more rapid advances.

4. The central purpose and effect of this phenomenon is an escalating and all-pervasive capacity to harness, access and apply information and diffuse knowledge at electronic speed to all walks of human activity. This is revolutionizing not only processes of production and consumption and modes of organization but also the way people live, work and interact with each other. Information and knowledge have thus emerged as a central, strategic factor of economic and social progress. Today, countries are increasingly judged by whether they are information-rich or information-poor.

II. Information and communication technologies, globalization and the new knowledge-based economy

5. Together with efforts to open markets and accelerate international trade, information and communications technologies are central drivers of the globalization process, affecting all human and societal activities. In the "new networked economy" taking shape in industrialized countries, a substantial share of GDP growth is attributable to the output and activities of the information technologies and Internet-related sector and to an unprecedented rate of technological change. In addition, the overall knowledge content of products and services is increasing. This is complemented by the emergence of "knowledge

workers" as a new type of economic actors. In sum, the world is witnessing the creation of a "digital economy" or knowledge-based economy and society.

6. Information and knowledge will be playing a lead role in the world economy of the future — the post-industrial or advanced industrial society — comparable to that of traditional production factors in the past, such as steam or electricity. Today, the volume of information is growing at an accelerating pace. Information and knowledge seemingly make time, space and distance shrink. They affect the international division of labour, bring about new patterns of economic engagement and social interaction, determine the competitiveness of economies and corporations, generate new growth patterns and bring about hitherto unknown products, jobs and livelihoods. The ICT industry in the United States is estimated to account for one third of United States economic growth and employs 7.4 million persons at wages that are more than 60 per cent higher than the private sector average. Many signs point to a further rapid expansion of the ICT sector worldwide: total world bandwidth in 1996 amounted to 200 trillion bits/day; in 2001 there will be a bandwidth of 9,000 trillion bits. Today there are 400 million personal computers and about a billion telephones in the world; 10 years from now, according to some forecasts, there will be 1 billion personal computers and 3 billion telephones.

7. ICT serve as a transmission belt to generate, access, disseminate and share knowledge, data, information, and communications and best practices. Three central features are at the heart of the knowledge revolution. Information and knowledge are instantaneously accessible, they are transportable and can be simultaneously distributed to an unlimited number of users. Indeed, they cannot be depleted. Their use by one does not prevent their use or consumption by another. They cannot be owned, though their delivery mechanisms can. Selling them entails sharing, not exclusive transfer. Indeed, information and knowledge represent a global public good.

8. A networked structure and networking activities are other novel features of the digital economy. Nations and corporations are transforming themselves into a networked world economy where everybody can communicate directly with everybody else, where hierarchies lose importance and where popular participation is becoming increasingly widespread and influential.

9. What, then, constitutes a knowledge-based economy? Such an economy will have undergone a substantial sectoral restructuring, accomplished the integration of new ICT-based products and processes, and relied on knowledge-based approaches and management. Not only will there be a strong emphasis on the production of ICT-related hardware and software affecting the secondary sector, but there will also emerge entirely new products and services enriching the tertiary sector, which may be labelled information and knowledge services.

10. For many countries, the transition to a knowledge economy will not occur automatically. Above all, it requires leadership. The move to a knowledge-based society calls for a broad-based understanding among national leaders, decision makers and the population at large as to the changes that are occurring and the measures to be taken to transform and position countries in the global economy.

11. Leadership, vision, the articulation of policies and a coherent strategy, systematic planning and efficient implementation are critical success factors. The

ultimate objective should be a knowledge and information society, that is, a society endowed with the ability, capacity and skills to generate and capture new knowledge and to access, absorb and use effectively information, data and knowledge with the support of ICT.

III. Characteristics of the knowledge-based global economy

12. This information revolution is being driven by the convergence in communication and computing technologies, the rapid growth in network computing and the sharp decline in the cost and price of information processing, which are making information and knowledge more important and more readily accessible. This revolution is pervasive in its impact and is transforming existing economic and social relations into an "information and knowledge society", and is one of the key driving forces and main vehicles for the process of globalization and interdependence. While it is a market-driven and market-oriented phenomenon in which the private sector has played and continues to play a key role, public service sector support has been critical in nurturing the revolution and, in particular, for the development of information highways in the developed countries.

13. This greater application of information and knowledge is emerging as a new determinant of competitiveness for firms and countries. In fact, adequate access to information and knowledge is increasingly becoming an imperative, a necessary condition for a presence in the market. While the full extent of the impact of the ICT revolution is yet to be understood, it is clear, however, that economic success in this new and rapidly changing economic environment will require considerable agility and adaptability. Those countries, sectors, organizations and individuals that can adapt will fare better than those that cannot or will not adapt.

14. New information technologies, by reducing the cost and speed of communication, have played a critical role in "globalizing" production and financial markets. In turn, globalization has spurred technological diffusion and the adoption of new forms of work organization. Knowledge and information have become significant factors in production and services, and are increasingly providing the cutting edge in successfully competing in the global economy. For instance, in a number of major industries in developed countries, there is a move by large corporations towards consolidated online purchasing. Existing and potential suppliers (especially those from developing countries) who lack fast and reliable access to these technologies and networks will find themselves at a competitive disadvantage in these industries. For them, expansion of e-commerce, instead of facilitating their enhanced participation in global trade flows, may become another trade barrier.

15. The convergence of communication and computing technologies, especially through the Internet, is the most significant feature of this information technology revolution. The Internet is a widespread information infrastructure. It is at once a worldwide broadcasting system, a mechanism for information dissemination, a medium for interaction between individuals, and a marketplace for goods and services. It is therefore rapidly becoming a global communications and information tool and a source of considerable economic potential for individuals, firms and countries.

16. Official national income accounts do not fully capture the scope of Internet-based economic activities. Therefore the extent and size of economic activities resulting from the impact of the Internet on the international economy are not yet fully known. Estimates for a number of economies suggest, however, that the share of the information technology sector and of the "Internet economy" is growing fast and rivals that of the leading "old economy" sectors, such as energy and automobiles. The growth of the "Internet economy" is further amplified by the rapid adoption of the use of information technology by sectors of the "old economy" in their existing activities in general and their movement towards e-commerce in particular.

17. The digitalization of production of goods and services is a principal feature of the emerging networked global economy where an increasing share of economic value resides in items with negligible physical characteristics, such as weight. The implication of this development is that, for example, instead of a material product being traded, it is increasingly the knowledge to create and use that material product that is being traded. Knowledge and information are now in their own right the commodities of value in the networked global economy. The developmental possibilities of this new reality are enormous.

18. In a knowledge-based economy the nature of work, the range of occupations and the skills requirements also change. Work becomes more flexible and adaptable to production structures, and work arrangements that are less regulated, more geographically dispersed and diversified are emerging. New jobs that did not exist 10 years ago have appeared on the labour market. As a consequence, a broader knowledge base is needed that enables people to find their way in the information society. Such knowledge includes learning skills, key technical skills and a range of social skills. Education and training, the institutions through which those are delivered, and the degree of access to them are critical factors in taking advantage of ICT. These are also key determinants of competitiveness in the global economy.

19. It is particularly important to underscore that the Internet, which gave rise to the emerging new networked economy, is at the very start of its life cycle with continued growth likely to occur, and even accelerate, in the years to come. It is therefore imperative to take steps now to ensure that developing countries are not left behind for lack of resources or a failure to recognize the significance and the potential of the shift from traditional voice-based telecommunications networks to the Internet.

IV. The potential of information and communication technologies for advancing development

20. There is substantial empirical evidence in support of the observation that societies and economies are being transformed by the ICT revolution in ways that increase productivity, enhance the quality of life, reduce prices, create new economic activities and new employment opportunities and generate wealth. However, ICT is also one of the factors behind the observed increase in income inequality and the fall of the relative wages of the least skilled over the last two decades within most countries of the Organisation for Economic Cooperation and Development, countries with economies in transition and many developing countries. The extent of the economic transformation brought about by the ICT

revolution is not evenly distributed across the globe and the expected benefits will therefore not be equally shared unless urgent action is undertaken to change existing trends.

21. Consequently, the development agenda will increasingly have to reflect these new realities and new potentials. Creation, acquisition, sharing and management of knowledge should play a qualitatively more prominent role, in addition to the transfer of physical and financial capital, as a key to development and poverty eradication. The empowerment of women and men to utilize new technologies and to apply their creative potential, knowledge and ability to their development challenges appears increasingly to be one of the keys to enhancing the capabilities of developing countries and poor communities to leapfrog stages of development and thereby close the income and human development gap that today separates them from the developed world.

22. ICT offers opportunities for new and faster growth patterns at the country level, based on new products, and new forms of employment opportunities and livelihoods. Many countries, including developing countries, have experienced a positive correlation between the consumption of information technology and technological development as well as economic growth. ICT-related production, such as software development or manufacturing of computer components, in some countries has developed into a dynamic sector of the economy in its own right. In Costa Rica, for example, exports from the microchip industry account for 38 per cent of all exports. In India, software exports will exceed $4 billion in 2000, and the service economy already contributes more than 60 per cent to the economies of cities such as Mumbai.

23. Beyond inducing a large-scale restructuring of national economies, information and communications technologies are cost-effective development tools. They have the capacity to reach deeper in geographical terms and more people than traditional means and they can deliver faster, with higher quality, and at a lower cost.

24. ICT can shape and enhance a wide range of development applications — from electronic commerce and assistance to small and medium-sized entrepreneurs to the empowerment of communities, women and youth, from the promotion of good governance and decentralization to advocacy programmes, including the observance of human rights, from long-distance education to telemedicine to environmental management and monitoring. The potential to help reduce poverty, foster sustainable development, empower people, build capacities and skills, facilitate new and transparent governance mechanisms (e-governance) and reinforce popular participation and informed decision-making at all levels is enormous.

25. The impact of the new technology on employment is already visible in terms of changes in the international division of labour. Some developing countries have a comparative advantage because they have the requisite skills at a lower cost. This can be a source of significant potential for employment creation in developing countries. In terms of the structure and functioning of the domestic labour markets, developed countries are confronted with a shortage of skilled labour and are therefore trying to attract qualified labour from developing countries. This has a dual effect on developing countries: the flow of remittances is increasing, but they lose qualified workers for their national development. Both these types of changes reflect increased international competition in products between countries and intense

economic competition at the micro level among firms in relation to costs and productivity. Recently, qualified ICT professionals from developing countries, such as India, have been increasingly prominent in Internet-based businesses in developed countries, including the United States. In some instances, a reverse flow of knowledge and financial resources back to countries of origin has been facilitated by successful expatriates.

26. The applications of information technology also offers an enhanced opportunity for the integration of the economies of developing countries and economies in transition into the increasingly networked knowledge-based global economy. In fact, for some developing and transition countries, in particular the small island developing States, the Internet provides the only opportunity to carve niche markets for their unique endowments. For most countries, though, wide-ranging ICT applications include improved agricultural and manufacturing productivity, health and education, generation of employment, industry, trade and finance, empowerment of people, environmental protection, prevention and management of disasters and information- and knowledge-sharing in development experience (see annex).

27. Trade is an area of particular significance because, if developing countries and countries in transition do not catch up with developments in this area and participate in the phenomenal growth of e-commerce, including business-to-business transactions, they will be confined to the fringes of the international economy.

28. Electronic commerce (e-commerce) reduces the importance of physical distance and transportation costs as barriers to entry into international product markets, making it possible for even small firms to market their products and services around the world in a competitive manner. Developing countries tend to have an extensive small business sector and therefore such a development will be beneficial provided that their firms are capable of capturing the opportunities presented by e-commerce developments to market their potentially competitive products.

29. There are three main types of e-commerce: business-to-consumers, or B-to-C, business-to-business, or B-to-B, and business-to-Governments, or B-to-G. The last two offer particularly positive prospects to developing countries, in particular from the point of view of participation of smaller firms in international ventures and from that of increased transparency and efficiency of public procurement. Opportunities to maintain and create comparative advantages in developing countries exist not only in the new sectors and service activities which lend themselves to on-line transactions (such as software, music, distance-servicing of complex systems), but also in the sectors where developing countries and economies in transition currently see their advantages eroded by e-commerce. Such activities include, in particular, transport and tourism, but also all other sectors in which new trading techniques could develop, including manufactured and semi-manufactured goods, and even primary commodities. A key element in the success of e-commerce strategies in developing countries and economies in transition will consist in stimulating exchanges of experiences among the public and private entities involved in e-commerce and related activities. In many instances, the model implemented by the "first-movers" may not be the most appropriate for these countries, and innovative cost-effective solutions can be found which better suit local development needs.

30. In the area of B-to-B e-commerce, as companies in the sectors of the "old economy" seek to reduce purchasing and other operational costs, they are increasingly using information technology for coordination between their purchasing operations and their suppliers. For example, leading players in both the automotive, energy and mining industries are investing in private virtual networks that will run over the Internet and will link manufacturers and suppliers worldwide. These networks will electronically route product shipment schedules, products design, purchase orders, payments and other business information.

31. However, the real e-commerce revolution, which holds considerable potential for connecting developing countries to e-commerce developments, is taking place outside the boundaries of individual firms. New Internet-based intermediaries are emerging to serve as electronic hubs. They focus on specific industry-based verticals or specific business processes, host electronic marketplaces and use various market-making mechanisms to mediate transactions among business firms. These hubs create economic value by aggregating buyers and sellers and by matching them with each other. Aggregation improves the liquidity of markets by creating a critical mass of buyers and sellers, and such matching lowers transaction costs.

32. Although overshadowed by the other forms of electronic commerce in value terms, the digital delivery of products and services to consumers is also expected to grow rapidly. Digital products can bypass the wholesale, retail and transport network when being delivered to consumers over the Internet. Software, compact discs, newspaper and magazine articles, news broadcasts, stocks, airline tickets, banking transactions and insurance policies are examples of knowledge products. However, trading travel and financial services on-line seems to have fewer obstacles than trading other digital products and services, which raise copyright issues and are dependent on improvements in the Internet infrastructure. The barriers to entry in these industries in the form of capital investment are much lower for firms producing digital products than for companies producing their physical counterparts.

33. Further, these areas of electronic commerce are not location-specific and it has been easier for developing countries to attract investments in these areas. For example, services such as claims processing, secretarial work, airline ticketing, customer support and electronic publishing are already migrating from industrial countries to developing ones. To be able to seize the opportunity, developing countries need to move into low-cost digital communications technology. They must also develop the right skill base, because the main reason for relocation of services activities to certain developing countries is that they have the required skills and, furthermore, labour costs are lower than in developed countries.

34. The ability to use ICT improves the capabilities of firms in developing countries to participate in international markets, in facing the competition from multinational companies or in developing partnerships with them. Electronic commerce offers the possibility of levelling the playing field of global trade, but for that to be realized, a concerted effort is needed to develop a conducive environment and the necessary human and institutional capabilities in developing countries.

35. The availability of inexpensive and powerful hardware and software reduces the costs of setting up an electronic business regardless of location. It must be mentioned, however, that the relatively high cost of connection to Internet in many developing countries undermines their competitiveness in this regard. The open structure of the Internet makes it possible for small and medium firms to download

specifications and to bid on jobs that previously were available only to large companies via electronic data interchange systems. Once they are networked, the small and medium enterprises can thus acquire the capacity to punch above their weight. The same, judging by the experience of Costa Rica, Estonia and Finland, could be true about countries.

36. ICT have had a profound effect in the area of finance, both at the international and national levels. Countries and companies can have much greater access to financial markets than in the past. Financial sector, being one of the most information-intensive sectors of human activity, is benefiting importantly from new ICT, be it enhanced accessibility of markets and data, a more reliable creditworthiness and risk assessment or performance monitoring, instantaneous processing of financial transactions or global market research. The accelerating trends towards integration of global financial markets with ICT as a key instrument are likely to increase both the vulnerabilities and opportunities associated with these markets. The Asian financial crisis, having demonstrated that the emergence of the global financial network can have serious negative consequences for countries and economic actors, underscored the necessity of reassessment of the existing financial architecture and strengthening public action in this area in general.

37. The Internet has great potential to achieve and reinforce educational goals, owing to its flexibility and potential for interactivity. It is particularly relevant to the objective of increasing learner participation in the educational process and of promoting lifelong learning, for example through distance education. The use of Internet tools can also enhance the openness of education by equalizing educational opportunities, providing alternatives to traditional/formal education, and enabling the development of more community-based learning facilities.

38. A major area of Internet activity worldwide has been in higher education where Internet-based courses have been rapidly introduced in the last few years. In primary and secondary education, school networking initiatives, or schoolnets, can improve access to the Internet. Applications in non-formal education have also been developing, but at a much more basic level. The new models and initiatives follow a continuum between traditional models and the totally virtual ones. They imply profound changes in educational models and systems, but they must also overcome fear and resistance to change.

39. One of the most visible benefits of ICT is its capacities to improve health-care delivery, research and training. ICT affords health professionals and researchers rapid exchange of state-of-the-art information, distance learning, as well as access to urgent advice and diagnostic assistance. Health care is an information-intensive sector; therefore, it is no wonder that most national ongoing and planned health-care reforms include ICT of different types, degrees of sophistication and depth of use. With data and information being the dominant, basic commodity in health, the health sector has become, second only to the business sector, a major user and promoter of tools and methodologies to harvest knowledge through intensive use of ICT.

40. It should be stressed that health-related applications of ICT need not necessarily involve significant investment of resources. Experience of a number of developing countries has shown that even very modest investments in using ICT for enhancing health-care delivery produce significant results (see the example of InfoMed in Cuba in box 2).

Box 2
Cuba's InfoMed

Cuba's economic difficulties have placed a severe strain on the country's health system. As one of the steps undertaken to maintain the standards of health care under conditions where all kinds of resources are scarce, a national network of the public health system called InfoMed was launched. Since the country lacked an information infrastructure at the time, InfoMed began as a simple sharing of knowledge and facilitating access to health-related information via e-mail, with minimal commitment of resources. Since that time, the network has expanded to reach nationwide coverage with regional and provincial nodes, leading to broader applications, especially in the area of education. The successful experience of building and using InfoMed has demonstrated the value of ICT for national development.

41. ICT have numerous proven applications in agriculture — from crop forecasting to providing market information. Recently a particularly important application has emerged: using ICT to provide timely and accurate food security analysis data for both relief and development interventions. In many developing countries, in particular in Africa, many agriculture and rural development problems have been related to the weak information base for policies, weak institutions and lack of well-trained human resources. ICT can help bridge these gaps. A critical factor in meeting the challenge of food security in Africa is human resource development through knowledge-building and information sharing, and ICT are central to this process.

42. Poor networks and infrastructure exacerbate the difficulties in interaction between Governments and citizens in many parts of the world. Therefore, ICT as a tool for governance can make a difference in how citizens are provided access to and use of government information and government services, thus enhancing their participation in the governance process. Wide access and transparency of information exchange may contribute importantly to anti-corruption efforts.

43. With regard to environmental information assessment and early warning, digital technology for remote sensing is a vital component in the design and maintenance of a system of information gathering, monitoring and assessment. It has the capacity to maximize the ability of decision makers to provide early warning of emergencies and analysis for development of preventive measures of potential natural disasters and environmental degradation.

V. Problems and challenges in harnessing the potential of information and communication technologies

44. Applications of ICT for development are too numerous to all be listed in the present report. It is clear from the above that ICT have vast potential for development. However, unless there is affordable and equitable access and connectivity, prospects for partaking in the knowledge economy are dim. The cost of

going on-line varies considerably: from $18/month in Sweden to $78/month in Argentina and Internet access charges for one hour of $10.50 in Chad, where the average annual GDP per person is $187, making it unaffordable to most people. Without requisite human and institutional capacities, the framework and skills required for the use of ICT and the Internet may be lacking, making usage all but impossible. Without linguistically and culturally diverse digital content and material, a large portion of people, especially in developing countries, may be unable to understand and digest what is being offered.

45. ICT make it possible for knowledge to be shared widely and speedily. This should bring about a rapid narrowing of knowledge gaps and a resultant surge in economic growth and human well-being. Why, then, isn't this happening as fast as one might expect? Billions of people still live, untouched by the ICT revolution, in abject poverty with its implications of disease, illiteracy and despair. The emerging "new economy", characterized by a rapidly increasing reliance of value-creation on information and knowledge, is still very much a "rich country phenomenon". In these countries, massive restructuring through mergers and acquisitions and through new ways of creating comparative advantages and acquiring market shares globally are a widespread phenomenon. In this process of concentration of "knowledge power", will the first-mover advantage gained by the more advanced players become irreversible, or can developing countries and economies in transition use ICT to avoid further marginalization? The answer to this question is critical not only to the future prospects of these countries, but also to the stability and sustainability of the global economy in the twenty-first century. It is unlikely that markets alone will address the many problems and inequities that currently prevent the full realization of the developmental potential of the ICT revolution.

46. The benefits from new technology in terms of wealth generation and job creation are skewed and unevenly distributed between countries as well as within countries, mainly because of differential access to knowledge and to information and communication technologies. This reality has given rise to manifestations of a phenomenon variously referred to as the "digital divide" or "information poverty", which is characterized by the difference between those countries, regions, sectors and socioeconomic groups which have the resources and capabilities to access knowledge through information technologies, and those lacking such access. This phenomenon brings into focus the growing inequalities and incomes and inequitable patterns of development.

47. Although there is a direct correlation between national income and access to the Internet, differential access to the Internet is much more pronounced than national income inequalities across the world. For example, the fifth of the world's people living in the highest-income countries have 86 per cent of the world's GDP but 93 per cent of Internet users, whereas the bottom fifth have 1 per cent of GDP and only 0.2 per cent of Internet users.

48. Even within each region, it is only a small minority of each society that has access to the global ICT network (see table). Even where modes of high ICT use or production have developed in developing countries, the tendency is for those to be linked to the global networks of production and use, whereas the majority of the local market and people remain outside. While these modes may lead to export-led growth and job creation, they also tend to increase inequality in income and opportunities. Factors of gender, levels of education and literacy, household income,

language, race and ethnicity are all critical determinants of access within countries. The typical Internet user worldwide is a male, under 35 years old, with a college education and high income, urban-based and English-speaking. Access to information and knowledge is thus becoming a factor, like income and wealth, by which people and countries are classified as rich and poor.

49. The number of people connected to the Internet is expected to grow very rapidly, but the underlying pattern of differential access is not likely to change, particularly in the absence of any concerted effort to bridge the divide.

Table
The number of people "on-line" as of March 2000

	Total number (million)	*Estimated population (million)*	*Share of population (percentage)*
Africa	2.5	805.2	0.3
Asia/Pacific	54.9	3 517.4	1.6
Europe	72.0	728.9	9.9
South America	8.8	346.5	2.5
Middle East	1.3	170.7	0.8
North America	136.1	307.0	44.3
World total	**276.0**	**6 080.0**	**4.5**

Source: Nua, Ltd. (2000) for people on-line.

50. The digital divide is also reflected in the production of information technology. Currently, 55 countries account for 99 per cent of worldwide spending on information technology production. Moreover, the ongoing process of globalization helps to consolidate the first-mover advantage of the developed countries, thus making it difficult for developing countries to reap real benefits from the production of information technology.

51. The distribution of Internet protocol bandwidth is another indicator of the differential access that characterizes the emerging knowledge-based networked global economy. Currently, more than 98 per cent of global Internet protocol bandwidth, at the interregional level, connects to and from North America. The level of bandwidth between the regions of the South is negligible. North America, essentially the United States, operates as the hub of Internet traffic and developing countries are having to make payments for traffic exchange and connectivity to United States telecommunications carriers. Given the foreign exchange constraints of many developing countries, this arrangement merely exacerbates the differential access to information and knowledge as it leads to prohibitive connection costs in many developing countries. This arrangement contrasts with the arrangements for the international telephone network, wherein developing countries receive sizeable cash transfers from the developed countries under the accounting rate system. The shift towards the Internet from the traditional voice-based telecommunications therefore involves both a loss of revenue to developing countries and a direct cost for connectivity.

52. One important impediment in the fuller realization of the potential of ICT for development is the continued inadequacy of women's involvement and participation. According to available data, women account for 38 per cent of users in the United States, 25 per cent in Brazil, 17 per cent in Japan and South Africa, 16 per cent in the Russian Federation, 7 per cent in China and 4 per cent in the Arab States. This situation needs to be urgently corrected, in particular, since women are probably one of the groups that would benefit most from the empowerment that could be brought about by ICT.

53. In addition to the burden of an unfavourable environment and the legacy of inadequate economic performance and policies in some developing countries, ICT can sometimes meet with negative a priori reactions, such as the fear of accepting new kinds of dependence on the suppliers of information equipment, as well as concerns about the content of information flows across national borders. There are other factors also hindering promotion of ICT in some countries: apart from the well-known factors of lack of infrastructure and resources, concerns about security and privacy, cultural intrusion and loss of revenues to e-commerce, as well as language barriers and cost factors, tend to inhibit the spread of ICT and its universal usage. An additional complication is that, traditionally in many countries, fixed-line networks have usually been State-owned and thus heavily regulated, with the costs of creating the required infrastructure borne by the State. With mobile networks, infrastructure investment is normally undertaken by a private company, start-up costs are in major part borne by subscribers, and state regulation is often tentative. The legal and institutional environment can thus be an important constraint. All these realities raise issues that need to be explicitly addressed if ICT are to become widespread.

54. Access to information and knowledge is essentially determined by connectivity, capabilities, and content. It is in these three areas that urgent action is required to ensure full access to ICT by developing countries.

55. Connectivity involves the material and physical access to the global information infrastructure and services, including computer hardware and software. For developing countries, there are considerable constraints to connectivity associated with the lack of basic physical infrastructure, such as telephones and electricity. The costs of developing these basic infrastructures are so large that individual Governments of developing countries or development agencies find it difficult to meet them.

56. However, lack of basic infrastructure need not be an overwhelming constraint to access by developing countries. There are technologies that allow "leapfrogging" and that should be explored as part of the efforts of seeking to connect developing countries to the emerging networked knowledge-based global economy. For example, wireless access through digital mobile phones will help accelerate the spread of the Internet to developing countries, since this technology can be provided as a primary service in countries without sufficient wire-line infrastructure. Wireless is already used as a primary service in many developing countries, including, for example, in China, Colombia, Lebanon, Malaysia, the Philippines, Sri Lanka, South Africa, Thailand and Venezuela. According to some estimates, it will be possible to access the Internet through about one billion devices in the world in 2003, one half of them being mobile phones. There are already close to half a billion mobile phone subscribers in the world, and their number is increasing at such a rate that they will

surpass conventional fixed lines during the first decade of the new millennium. The Internet can also be accessed via geostationary satellites although these systems are not optimized for Internet use and, therefore, are quite expensive. In spite of the cost constraints, there are some African Internet service providers using this access technology.

57. To connect the majority of the poor, especially the rural and peri-urban poor, in developing countries will require innovative approaches, including a paradigm shift from individual connectivity, which has been prevalent in developed countries, to community connectivity. In this regard, the development of integrated multi-purpose community information centres, such as "Telecentres" will be crucial. Such centres will enable users to have access to information and knowledge at minimal cost. The value-added of such centres can be further enhanced if training in literacy, especially information technology literacy, is provided. Deliberate efforts should also be undertaken to ensure access to women, youth and the disabled in order to maximize the potential of telecentres as vehicles for democratizing access to the information society for the urban low-income and rural communities (see the example of "LINCOS" in box 3 on Costa Rica). Telecentres are emerging as a significant mode of connectivity in many African countries as the implementation of the African Information Society Initiative[4] unfolds.

Box 3
Information and communication technology in Costa Rica

Costa Rica has pursued a strategy geared towards widespread adoption of ICTs in its national sustainable development programme, and it attributes much of its current economic growth (8.3 per cent of GNP growth rate in 1999, the highest in Latin America) to that strategy. The success of this endeavour was due to strong political leadership. The components of Costa Rica's ICT strategy included a strong focus on education and appropriate skills development nationwide, and a determined effort to use ICT to help integrate isolated rural populations into the national economy. Among the steps undertaken were:

(a) Installation of computer laboratories in 100 per cent of the nation's public high schools;

(b) Introduction of "smart cards" nationwide and their widespread application with respect to public administration, transportation, public telephones and health services;

(c) Development of self-contained multi-purpose/multimedia mobile units that could be transported to any rural community. These units (called "LINCOS" — little intelligent communities), housed in a regular cargo container and powered by their own generators, provided a variety of functions, including Internet access, training in ICT, a small theatre and e-mail facilities.

58. Although connectivity is a crucial first step in ensuring access, capacity, human as well as institutional, is critical in sustaining access and ensuring that the

benefits of access are captured by society. Investment in basic literacy and education remains the fundamental way of developing human capacity in developing countries and should be at the heart of any national information technology strategy. Education and literacy also increase the demand for the use and application of information technology. Technological literacy is highly correlated with the use and diffusion of ICT. The need for higher education and technical training that help develop life-long learning skills is thus evident.

59. Complementing connectivity and human and institutional capacities in ensuring access is content. The importance of development of local content on the Internet is to ensure a culturally and linguistically diverse cyberspace. A diversity of languages on the Internet will enable the production of appropriate local content for and the participation of everyone as well as ensuring sustainable access. The fact that over 80 per cent of the content on the Internet is in English means that, for more than 75 per cent of the world's population, the Internet is not realizing its potential of being a source of information and knowledge. The development of local content is also a way of preserving and disseminating social, linguistic and cultural heritage of a people or locality. This is very important for the many small languages that are facing extinction in the digital age as well as for indigenous knowledge, which in many places remains unwritten, and thus risks disappearing. Experience has shown that, in countries where local content has been developed, the use of the Internet has spread rapidly. In China, for example, an explosion of Internet activity followed the creation of Chinese-based interface (see box 4). Introduction of the Cyrillic character sets for computer interface in 1997 has brought about a rapid growth of local content of Internet information in the Russian Federation with the result that currently 60 per cent of all Internet traffic is within the country.

Box 4

Growth of Internet activity in China

In **China**, over 95 per cent of the population neither speaks nor reads English. Therefore, the development of Chinese character sets for use in computer interface was imperative to ensure the presence of local content. As a result of a national technological initiative, Chinese character sets were introduced in 1996, and a very rapid expansion of ICT activities followed. Between April 1994, when the first 64 Kpbs leased line was opened, and the end of 1997, only 300,000 computers were connected and web sites numbered 1,500. By the end of 1999, the number of connected computers had surged to 3.5 million and over 9 million users were connected to the Internet; 1 million through leased lines, 7 million through dial-up connections and 1 million using both. Another 200,000 users are connected using mobile phones (cellular telephone growth is the fastest in the world and has exploded to over 50 million units in only some 7 years) and personal digital assistants (PDAs) and this sector is growing very rapidly. There are now 35.6 million e-mail accounts. Today there are nearly 50,000 top-level domain names registered, of which 39,000 are registered as *dot.com*. And total bandwidth of the leased international connections has been increased to 351 Mbps. At the top level, there are five large Internet service providers, all State owned, of which three are in commercial operation and one,

Chinanet, has 83 per cent of total accounts. In March 2000, these five Internet service providers were connected within China for a 15-fold bandwidth increase to 1G. Private Internet service providers are permitted, though connectivity through the five Internet service providers is required. Currently, there are roughly 520 Internet service providers and 1,000 Internet content provider accounts, many of which are financed with private or joint-venture capital.

Distribution, however, remains unsatisfactory with the 10 coastal provinces accounting for 71 per cent of users and the 7 most western provinces accounting for 20 per cent of the population but only 5 per cent of Internet use. Great efforts are under way to increase connectivity with the rural population

60. Local content can also serve as a key input in the development of knowledge products by individuals and firms in developing countries. It is through developing and marketing of local content that developing countries can gain an entry point in the new networked economy because the barriers to entry in this respect are lower. Examples of these developments are being observed in a number of developing countries.[5]

61. Local content is also an empowering tool for a multitude of civil society organizations and their members as well as for citizens who are able to obtain information on Government activities and are thus able to take informed action and participation. Local sites linked to other sites of mutual interest allow for the sharing of experiences and knowledge — a process that is critical for building consensus and enhancing learning and development. In this context, development assistance needs increasingly to be seen as not simply a process of financing physical facilities, but also a process that is invigorated by people's abundant ideas and inspirations. In this way, a culture can draw on its local know-how, including indigenous knowledge, which is then reinterpreted and developed in the light of the most useful approaches from elsewhere. Knowledge practices in international institutions need to be open and responsive to inflows from any source.

62. From the above and other available data on the "digital divide", it is clear that, unless radical and decisive action is pursued, the differential access to information and knowledge will become much more acute. Clearly, such action cannot be left to market forces alone; it requires a collaborative effort involving Governments, multilateral and bilateral donors, the private sector and other stakeholders, such as non-governmental organizations.

63. While communication can be considered a vehicle for implementation of the Universal Declaration of Human Rights (art. 19), specifically with regard to the right to freedom of opinion and expression, privacy and protection of law against interference (art. 12), info-ethical issues, including empowerment and participation need to be addressed. Beyond these, the issues of unwanted information in cyberspace, which is being used for criminal activities, also need to be addressed. There is a need to work out international legal regimes to prohibit the development, production and use of the most dangerous types of information and to struggle

against information terrorism and criminality through the monitoring of threats to security of global telecommunication and information systems.

VI. Recommendations: a programme of action for bridging the digital divide

64. Knowledge is the only resource whose potential impact on human development is constrained not by its scarcity, but by our current inability to use it adequately. Knowledge cannot be simply redistributed, as money can; it needs to be nurtured, requiring coherent efforts by all actors. Available studies have shown that provision of technology by itself has little impact on economic productivity or welfare. Without the people-based arrangements of networks, communities or other groupings by which individuals and communities can share their knowledge, technology has little, if any, benefit.

A. National action

65. ICT will advance development only if related efforts and programmes are integrated in a coherent national development strategy. National Governments should therefore be the primary actors, in concert with the private sector and civil society, in the pursuit of access for all to information technology for development (see box 5). They need to enunciate their own national vision, galvanize the necessary political will, at the highest level, devise a national strategic framework, establish national priorities and provide a conducive environment for the rapid diffusion, development and use of information technology. Countries also need to make choices that enhance national comparative advantage. As the experience of developing and transition economies that have been successful in designing and implementing a national ICT development strategy has shown, such an endeavour requires strong political commitment and determination at the highest level and the mobilization of the necessary resources.

66. The development of the basic infrastructure necessary for connectivity requires complementarity between determined government policies to ensure connectivity, including for most remote areas, and private sector participation, which could be facilitated if Governments would provide a conducive policy framework, including steps towards liberalization, privatization and competition and the removal of excessive levels of tariffs and taxes as well as strong property-rights regimes that foster investment in the development of technology. It also requires investments in human resource development at the level of basic literacy and primary education and in developing a skilled labour force and managerial skills.

67. Institutional capacities to collect, organize, store and share information and knowledge through the networked technology infrastructure are as critically important as human capacities. In fact, they are necessary complements to human capacities and need to be developed if developing countries are to capture the benefits of the networked global economy. Governments of developing countries and countries in transition, as a first step, should pursue the application of information technology in public institutions, such as schools, hospitals and clinics, libraries and government departments and agencies. The concept of "public service sector consortia" has been used in some countries as a catalytic factor in

empowering the public sector, pooling of resources and making progress on a broad front in cooperation with the private sector. They also need to nurture and support the private sector by providing institutional support, reducing barriers to entry, developing sources of financing and helping create and expand markets through, *inter alia,* tax incentives and export promotion zones.

68. "Public domain" information, which is free of copyright and belongs to everybody, is often paradoxically not well known enough to potential contributors and users for lack of interest in promoting it, no direct profit being expected because of its very "public" nature. Thus, Governments and other public service organizations may have very rich and diverse information stocks whose identification, digitization and dissemination through the Internet would benefit all. This information includes that produced by public organizations and that which has fallen into the public domain, as well as a growing amount of information produced by persons willing to allow their intellectual productions to be disseminated freely under certain conditions, such as many results of academic and scientific research and open source software. The national electronic public domain is, in fact, part of a vast and growing international virtual public library that complements, and in fact nurtures, the commercial intellectual property sector.

69. Governments of developing countries need to take active steps in encouraging the production of local content. Such steps involve the establishment of conditions for the development of digital content industries, including intellectual property provisions; the promotion of multi-lingualism and of an open and transparent framework for content development; the promotion of local content in the public service sector and of an electronic public domain; and assurance of unfettered access to the Internet where it is available and the raising of public awareness as well as the strengthening of informatics education.

70. Communicating knowledge involves not only taking advantage of new ICT, but also even more importantly strengthening the networks and communities that are essential for any large-scale sharing of knowledge. Public action is required to provide information to verify quality, monitor performance and regulate transactions to provide the foundation for successful market-based development.

71. Developing countries should strengthen their own capacities to authenticate knowledge. Development knowledge bases will reach their full potential only if practitioners in developing countries have an appropriate role in authenticating the know-how that is contained there. A participatory process will make possible joint ownership and use of the knowledge.

B. International cooperation: towards global partnerships in information and communication technologies

72. The international community and the United Nations system have an obligation to assist developing countries and countries in transition to fully and beneficially integrate into the networked knowledge-based global economy. Assistance is needed in providing secure and reliable connectivity, in developing human and institutional capacities and in the development of content which reflects global diversity. Failure to assist developing countries and countries in transition to fully and beneficially integrate in the networked knowledge-based global economy

portends ill for the process of globalization and interdependence as well as for international efforts at poverty eradication and sustainable development.

73. This is a particularly propitious time for launching a major global effort based on global ICT partnerships for achieving universal basic access to ICT services within a time-bound framework of perhaps five years. The Economic and Social Council's high-level consideration of this issue should be seen as an opportunity to build on the General Assembly's resolution on globalization, on the Secretary-General's millennium report, on the South Summit's proposals relating to ICT, and on the work of the high-level panel of experts held in April. The outcome of the Council session should serve as the foundation for the Millennium Summit and the Assembly to launch the Global ICT partnership and the programme to carry it out.

74. Public-private partnerships will need to play an exceedingly important role in the quest to achieve universal and affordable access to ICT, building the requisite capacities and generating diversified digital content — in short, to move to the global knowledge economy. The technical and managerial expertise and knowledge required as well as the enormous financial and investment needs make it advisable, indeed imperative, to pursue, on a large scale, partnerships by national and multilateral actors with the private sector. In his Millennium report, the Secretary-General announced several such partnerships in that area. Clearly, many more opportunities exist and, to that end, innovative approaches and initiatives should be encouraged and supported.

75. Stronger partnerships are needed within the donor community in order to avoid wasteful duplication and to foster collaboration and openness among multilateral development institutions. This will also facilitate the sharing of best practices and experiences. The donor community needs to function as an efficient connector and facilitator to promote the creation and dissemination of knowledge to enhance global welfare.

76. Developing countries often learn best from each other, since the real experts are those who live the reality of the problems of underdevelopment on a day-to-day basis. Programmes for facilitating South-South knowledge flows, which link practitioners in developing countries through real or virtual conferences across national boundaries, can greatly accelerate the effectiveness of these knowledge flows. Networks of learning communities in the South can greatly expedite the flow of relevant know-how and information. There are a number of developing countries that have made considerable strides in the application of information technology and in attracting investments and developing their information technology sectors. Their experiences will be valuable to other developing countries.

77. South-North knowledge flows are important to ensure that the objectives of development assistance are contextual and relevant and are also understood and shared by all the stakeholders. Knowledge-sharing programmes should be oriented to the needs and capabilities of users in developing countries. They should also draw on the local know-how and the indigenous knowledge which are available.

78. Related to the concentration of ownership of knowledge products are major concerns regarding the appropriation of knowledge that should remain in the public domain as well as the appropriation of the knowledge of indigenous groups and marginalized peoples. The knowledge-based economy requires international cooperation in developing appropriate institutional arrangements that will provide

sufficient incentives for the development and sharing of information and knowledge products while averting the marginalization of communities and countries.

C. Role of the United Nations system

79. At its meeting in Headquarters in April 2000, the high-level panel of experts convened in response to the mandate contained in General Assembly resolution 54/231 drew upon the successful experience of a number of countries to identify the principal ingredients of successful national ICT development strategies in its report (A/55/75-E/2000/55), which has been made available to the Council. The report also identifies areas and actions that the international community, in particular the United Nations system, should undertake to support national ICT strategies and programmes.

Box 5
Report of the high-level panel of experts: action points

We firmly believe that, at the national level, Governments, the private sector and all segments of the civil society must unite to address this challenge. We also assert that the international community, especially the United Nations, has a special obligation to assist countries in maximizing the benefits they can secure from ICT.

In this regard, we present our proposals and recommendations on how to bring greater coherence and synergy to the many uncoordinated activities currently undertaken, with limited effect, by individual organizations of the United Nations system, including the World Bank, by the European Union, the Organisation for Economic Cooperation and Development and numerous other multilateral and bilateral organizations.

The panel believes that the international community, working in concert with national Governments, private business and civil society, is fully capable of reversing the current alarming trend of the growing "digital divide" and must do it. The panel calls on all actors to unite in a global initiative to meet the following challenge: Provide access to the Internet, especially through community access points, for the world's population presently without such access by the end of 2004.

The panel proposed the following action points for reaching this goal:

(a) The United Nations, at the Millennium Assembly in September 2000, should proclaim the right of universal access to information and communication services, such as the Internet, as an important new component of the United Nations principles and conventions on human rights and development;

(b) The United Nations should create, under the leadership of the Secretary-General but outside United Nations organizational structures, an ICT task force. This task force should bring together multilateral development institutions, private industry, foundations and trusts and would facilitate, including by investment, the expansion of the market for

ICT in developing countries, thereby helping to bridge the digital divide;

(c) This task force would provide overall leadership and strategy for ICT development. A fund should be created that the task force would administer and for which up to $500 million would be solicited from sources such as the United Nations Fund for International Partnerships. This amount would be matched by funds raised from the private sector and foundations. The fund will leverage additional resources by assisting developing countries in implementing their own ICT programmes, provided they match the contributions from the fund;

(d) Organizations of the United Nations system should work with Governments and financial institutions for the writing off of 1 per cent of the debt of each developing country with the commitment that the country would allocate the equivalent financing to ICT for development. In a similar manner, the United Nations should work towards countries receiving international financing for ICT development on the basis of their progress in carbon-fixation activities.

80. Given that markets are unlikely to deliver universal access, the United Nations system has a critical role to play in assisting developing countries to maximize the opportunities presented by the information revolution in their pursuit of economic and social development. The major component of this role should be to facilitate the movement on a number of key directions.

81. An important task for the United Nations lies in building consensus and partnerships among all stakeholders — developed and developing countries, the public and private sectors as well as civil society, especially non-governmental organizations — that information technology is the critical determinant of the processes of globalization and interdependence as reflected in the emergence of a networked knowledge-based global economy. Efforts aimed at successfully integrating developing economies into the global economy, and at eradicating poverty and ensuring sustainable human development must take full account of the role of information technology as the driving force of this new economy. This is because information technology has emerged as the main vehicle by which knowledge propagates. It is in enabling people, wherever they might be, to connect and share knowledge that information technology is so important, for it is the harnessing of knowledge which is critical to the process of sustainable human development.

82. Ensuring access for all to information technology is a task beyond the scope of any one institution — governments, United Nations agencies, private sector companies or universities. The costs for each are prohibitive, the know-how too widely diffused and the different institutional strengths inadequate on their own. Therefore, in the drive for accessibility, partnerships between all stakeholders will be needed. The United Nations system, owing to its universality and democratic character of decision-making, its convening power as well as its capacity to harmonize divergent interests, is uniquely placed to build partnerships that foster knowledge flows for development. Global ICT partnerships, which are based on the principles and objectives of the United Nations system, could draw strength from the

premise that expanding access to ICT means expanding markets for these technologies. The report of the Secretary-General to the Millennium Assembly places particular emphasis on the need to develop global policy networks which can be greatly facilitated by the use of ICT and the Internet. The report also outlines a number of ICT initiatives for development and emphasizes the need to strengthen United Nations system capacity and coordination in this area. The Economic and Social Council may wish to extend its support for these initiatives and directions.

83. The experience of countries that have been successful in harnessing information technology for development suggests a commonality of a committed political leadership, a strong role for the private sector and the availability of finance, especially venture capital. In fact, while technological constraints to access for all no longer exist, financial constraints remain, as does inadequacy of institutional and human capabilities. Some initiatives for partnership between the United Nations system and the private sector have been embarked upon, as reflected in initiatives such as NetAid and the Roll Back Malaria Initiative, the establishment of the United Nations Fund for International Partnerships, the World Bank's joint initiative with the Softbank, and others. However, a more concerted and comprehensive effort is needed to involve companies in the technology and financial sectors in the drive for access-for-all to ICT and services.

84. One particular direction of the emerging partnership between the United Nations and the global private sector may be in finding new creative approaches for attracting private investment to the provision of ICT goods and services that currently are not feasible on a purely profit/loss basis, such as telemedicine, distance learning, cheap textbooks and non-textual computer interfaces for illiterate people. The United Nations should explore ways of bringing together the private sector, including private foundations, and multilateral and national agencies as well as non-governmental organizations in new partnerships for addressing the needs of the world's poor, including in particular their knowledge needs.

85. The United Nations system has successfully involved civil society, including non-governmental organizations, in its work. Non-governmental organizations have participated actively in drafting the development agenda encapsulated in the outcomes of the various world conferences and summits. They are also actively involved in reviewing the implementation of those outcomes by Governments and the international community. They therefore have the will and the proven ability to actively participate in the drive for access-for-all to information technology. Their comparative advantages in raising awareness, training and developing local institutions will be crucial to the success of any effort to ensure accessibility. Likewise, other institutions of civil society, such as universities and foundations, have a central role to play.

86. ICT offer the United Nations system and the international community opportunities in strengthening the effectiveness and outcomes of development cooperation and in ensuring the efficient functioning of the system itself. Central to this is the pursuit of policy coherence and coordination of efforts. The application of information technology for development by the different entities of the United Nations system, within the context of their respective mandates, will have different features but also strong commonalities that might lend themselves to replication. Policy coherence and coordination within the United Nations system will need to be strengthened to ensure that efforts will not be wasteful and will contribute optimally

to the desired goal of access-for-all and ultimately to poverty eradication and sustainable human development.

87. The United Nations system should place a new focus on developing a knowledge-sharing and -learning culture rather than on ICT alone. It is knowledge and learning capacity that will increasingly determine development outcomes rather than investment in physical capital alone. The organizations comprising the United Nations system need to become learning organizations. This calls for a comprehensive and coordinated approach in building knowledge acquisition and dissemination capacity.

88. Urgent and coordinated action is needed to arrest the further marginalization of developing countries, countries in transition and poor communities as a result of lack of access to knowledge and information through the global information infrastructure. The Economic and Social Council may consider endorsing the statements of the Administrative Committee on Coordination of 1997 and 2000 for a coordinated response by the system to the challenges posed by the ICT revolution and its call for a World Summit on the Information Society, where a global action plan for access-for-all can be elaborated.

89. The Economic and Social Council may call for a digital compact between the United Nations system, the private sector and non-governmental organizations as well as other stakeholders which will involve the joint pursuit of connectivity, capacity-building and content development through a portfolio of ICT cooperation projects aimed at providing access-for-all to the global information infrastructure. This would complement the global compact, which was launched at the 1998 World Economic Forum at Davos, Switzerland.

90. Full and effective realization of the potential that ICT have for development is predicated on internationally accepted legal instruments. The United Nations system should therefore aggressively pursue ongoing efforts to develop globally accepted norms for the authentication and inter-exchangeability of messages, adoption of digital signatures, electronic payments and contractual guarantees for electronic transactions, as well as common approaches to intellectual property issues on the Internet. National and regional participation, especially from developing countries, in these efforts is critical and needs to be encouraged.

91. The focus of work in the ICT area should be based on the recognition of the fact that ICT are merely tools for the creation, management and sharing of knowledge for poverty eradication and sustainable human development. It is advancements in knowledge and learning capacity that will enhance development, not just investments in the information infrastructure per se, which are means to an end. Towards this end, the United Nations system needs to develop a common culture for learning and action underpinned by a comprehensive and coordinated approach in building knowledge and acquisition and dissemination capacity.

92. The Economic and Social Council could contemplate setting up an "observatory", an advisory group of outstanding experts, which could absorb the mandate and activities of the Ad Hoc Open-ended Working Group on Informatics and complement the Commission on Science and Technology for Development with a view to creating a mechanism that would be in a position to provide the Secretary-General, the Council, the Executive Boards of the Funds and Programmes and

Governments with comprehensive, practical and action-oriented advice on policies and programmes and on new developments in the field of ICT for development.

93. The Economic and Social Council could also consider hosting, under its auspices, a series of semi-annual lectures of visionary and outstanding private sector, governmental and civil society leaders so as to highlight the latest developments to the United Nations community at large (akin to the Paul Hoffman lectures of earlier years, which focused on human development). Such lecturers should be drawn from all regions of the world to foster a true exchange among different approaches and cultures.

94. At the Economic and Social Council session, the substance of its high-level debate should be linked to the consideration of operational activities on its agenda. It would be desirable to articulate recognition of the fact that ICT is a high priority factor on the development scene. In that spirit, the Council may wish to encourage the governing bodies of the funds and programmes and specialized agencies of the United Nations system to reflect that sense of high priority in their programme priorities and resource allocations in order to foster the use and application of ICT in development cooperation activities.

95. The United Nations system should help develop and encourage policies that promote new forms of organization, including cross-functional teams, communities of practice and networks to complement existing structures and radically galvanize knowledge-sharing, learning and change. Particularly important and effective are institutional arrangements for sharing knowledge that go beyond hierarchical organizations and promote informal networks or communities of practice to transfer knowledge across organizational and other boundaries.

96. The United Nations system should encourage open global dialogues on development using ICT networks. Such dialogues should enlist clients, partners and stakeholders in sharing knowledge for development by having them join thematic communities and inviting them to participate in global dialogues on development.

97. The United Nations should assist developing countries in raising awareness, understanding the potential, the challenges and the options existing in development-oriented applications of ICT. As a first step, an inventory of all ICT-based development activities of the system worldwide should be compiled to provide developing countries with more informed choices in selecting approaches and providers.

98. For the United Nations system to play a more effective role in promoting the use of ICT for development, the system must itself get its own ICT house in order by, first of all, adopting a coherent ICT strategy that would ensure coordination and synergy of programmes and activities of individual organizations of the system. Second, the internal institutional and technical capacities of the Organization in the field of ICT must be strengthened.

99. Full and efficient implementation of the programme of action outlined in the present report will require not only political will and commitment at the highest policy levels in Member States but also consistent and comprehensive support for these actions by the organizations of the United Nations system. Creating effective system-wide institutional capacity for provision of such support will not only require commitment on the part of the leaders of the system but a concerted effort to

mobilize and commit the necessary resources for the United Nations system to play an effective role as a key partner in the global campaign to bridge the digital divide.

Notes

[1] The Economic and Social Council, in its decision 1999/281 of 30 July 1999, decided on the theme "Development and international cooperation in the twenty-first century: the role of information technology in the context of a knowledge-based global economy" for the high-level segment of its substantive session of 2000. In this connection, it is relevant to note that the General Assembly, in its resolution 54/231, requested the Secretary-General to prepare, in close collaboration with the United Nations Conference on Trade and Development and in consultation with other relevant organizations, a comprehensive report containing action-oriented recommendations on, *inter alia*, promoting further the role of the United Nations system in the transfer of information and communications technology to developing countries. The Assembly also strongly emphasized the need for entities of the United Nations system to have a strong component oriented towards assisting developing countries as well as countries in transition, in the area of information and communication technology.

[2] The present report should be read in conjunction with other documents that address the issue of information and communication technology from the developmental perspective, in particular the report of the Secretary-General entitled "We the peoples: the role of the United Nations in the twenty-first century" (A/54/2000), the report of the high-level panel of experts on information technology (A/55/75-E/2000/55), the report of the Committee for Development Policy (*Official Records of the Economic and Social Council, 2000 Supplement No. 13* (E/2000/33), chap. II), the relevant chapter of the *World Economic and Social Survey 2000*, the United Nations Development Programme's *Human Development Report 1999*, the *World Development Report 1998/99* "Knowledge for development" and the International Labour Organization's *World Employment Report 2001*: "The impact of ICT on employment" (forthcoming). The fact that the vital issue of the current and potential impact of information revolution on development is comprehensively explored by major bodies of the United Nations system testifies to the importance that is being accorded to the potential role that information and communication technology could play in development.

[3] Some publications refer to information technology. The potential of information technology for development can be more effectively realized if it is utilized synergistically with more traditional communication technology (such as television, video and, in particular for developing countries, radio). Therefore, the present report uses the designation of information and communication technologies (ICT) rather than only information technology when it addresses the developmental impact and potential of the information revolution.

[4] AfricaRecovery, December 1999, p. 20.

[5] On-line and multimedia educational content produced in South Africa, especially by its leading distance-learning institution, the University of South Africa, is used in neighbouring countries, while the Indira Gandhi National Open University is currently offering its programmes in several countries in the Middle East and plans are afoot to extend its coverage to other developing countries.

Annex

Statement by the Administrative Committee on Coordination to the Economic and Social Council on information and communication technologies and development

1. The Executive Heads of the organizations and agencies of the United Nations system reaffirm their statement of 11 April 1997 on "Universal access to basic communications and information services". As the United Nations system enters a new century, our overarching challenge is to tap more effectively the benefits of globalization for all people in all countries. Information and communication technologies play a key role in our efforts to meet that challenge. The Executive Heads recognize information and communication technologies as a critical development tool in advancing the globally agreed development goals emanating from the United Nations conferences of the 1990s and commit themselves collectively to reinvigorate collaborative action to harness the great power of new technology to promote development. The Executive Heads recognize the right of universal access to information and communication technologies, and knowledge as a global public good.

2. Access and connectivity to information and communication technologies are critical to the integration of developing and transition economy countries in the global knowledge society; enhancing efficiency and growth in key sectors of their economy; and supporting the social, economic and cultural goals of their societies. Information and communication technologies have wide-ranging applications cutting across sectoral boundaries in agricultural productivity; population, health and education; generation of employment; transportation; industry, trade and finance; empowerment of people and governance; environment; prevention and management of disasters; and information and knowledge sharing. In the development process, information and communication technologies are strategic factors and need to be systematically integrated in the development plans as well as programme priorities.

3. The present global outlook, though it has many encouraging aspects, represents a challenge for the United Nations system. While the total number of people with access to information and communication technologies is expanding rapidly, the digital divide is real and represents a gross imbalance in the access to or use of information and communication technologies in particular in the developing world. While a lack of resources is a major constraint, the problem has many facets. The spread of information and communication technologies and their universal usage require basic infrastructure and human resource development to support them. There are also serious concerns about security and privacy, about abuse for criminal purposes, about cultural identity, about loss of revenues to e-commerce, and about language and gender barriers. Though the technological gap may to some extent be leapfrogged without going through the traditional stages of development, access to such solutions presupposes an existing degree of wealth, or human resource development, that many developing countries and many people in developed countries do not have.

4. The Executive Heads recognize that there are a number of developing and transition economy countries that have made considerable advances in ensuring access and connectivity by their citizens and enterprises to the global knowledge

network. Often, the most effective policies appear to include an appropriate mix of market liberalization, private sector participation and independent regulation. Efforts should be made to facilitate the flow of information and the sharing of experiences and best practices among developing countries, particularly in the context of South-South cooperation.

5. Developing and transition economy countries should be further assisted in building up their infrastructure and developing the capabilities of their citizens, of public service institutions and enterprises in gaining access to and in managing information, as well as in applying both global and local knowledge to development. Harnessing local knowledge and perspectives, particularly those of marginalized groups as well as women, youth and indigenous communities, is important for development but also for ensuring that the content of cyberspace reflects also the world's cultural and linguistic diversity.

6. ACC is conscious of the need for further urgent, targeted and coordinated action from the United Nations system to support efforts to ensure access and connectivity to the global knowledge network for all and thus ensure the further beneficial integration of the economies of developing and transition economy countries into the global economy and information society. Such action should be embarked upon in partnership with all the stakeholders. In particular, our partnerships with the private sector must be consolidated and expanded. The system itself must keep current its knowledge of available information technologies and telecommunications systems and integrate these in its own operations and programmes to build its knowledge acquisition, adaptation and dissemination and rapid-response capacity.

7. In this regard, the Executive Heads welcome the forthcoming consideration by the Economic and Social Council of the theme on "Development and international cooperation in the twenty-first century: the role of information technology in the context of a knowledge-based global economy". The outcome of the Council's deliberations will further advance recognition of the importance of information and communication technologies and contribute to policy coherence, complementarity and coordination, as well as to the mobilization of resources in order to bridge the knowledge gap and optimize the benefits of globalization for the majority of the world's population, in particular the poor.

8. ACC recognizes that, while many initiatives have been taken in the United Nations system to promote and use information and communication technologies as an instrument of development, there is clearly need for more complementary and synergistic efforts in the use of information and communication technologies in support of the developing countries and in the operations of the United Nations system.

9. The Executive Heads agree that the following issues need to be pursued:

(a) Strengthen collaboration among organizations of the system, including at the country level, in computerization, networking, information management and software application and content development as well as in supporting country strategies for Internet development and ICT support;

(b) Organize a system-wide community of ICT experts and users through innovative networking and learning arrangements, as a system-wide resource facility and consultancy service for information on options, costs, good practices and

emerging developments; for use by organizations of the system for their knowledge management and ICT needs and for operational activities for development;

(c) Promote capacity-building and innovative use of ICT as a special opportunity to overcome the development barriers of isolated and distant communities, such as the small island developing States network;

(d) Carry out studies and policy consultations on the broader developmental, social and cultural impacts of ICT with a view to promoting the development and exploitation of appropriate content and of ethical and legal frameworks to ensure universal access while protecting basic human rights, and provide Member States with advice;

(e) Develop strong partnerships with the private sector both for internal systems and development activities, including along the lines of initiatives outlined in the Millennium report and those already taken, such as the Global Knowledge Partnership, the health network and the disaster relief network;

(f) Develop an inventory of systems being used and evolved, particularly for Headquarters-field communications, so that the possibility of synergy could be further pursued.

10. ACC has requested its relevant subsidiary bodies to follow up at the inter-agency level on the above issues, building on the Statement on universal access to basic communication and information services which it had adopted in 1997. In this context, organizations are invited to cooperate in preparations for the World Summit on the Information Society proposed by the International Telecommunication Union and supported by ACC at its first regular session of 1999.

11. The Executive Heads commit themselves to work, individually and collectively, towards making the goal of universal access to information and communication technologies a reality.